Claims:

1. Tetrakisfluoroalkylborate salts of general formula (I)

$$M^{n+} ([BR_4]^-)_n \qquad (I)$$

wherein
M^{n+} is a univalent, bivalent, or trivalent cation,
each of the ligands R are the same and straight-chained or branched, representing (C_xF_{2x+1}), with $1 \leq x \leq 8$, and
$n = 1, 2$ or 3.

2. The tetrakisfluoroalkylborate salts according to claim 1, characterized in that the M^{n+} cation is an alkali metal cation, preferably a lithium, sodium or potassium cation, and more preferably a lithium cation.

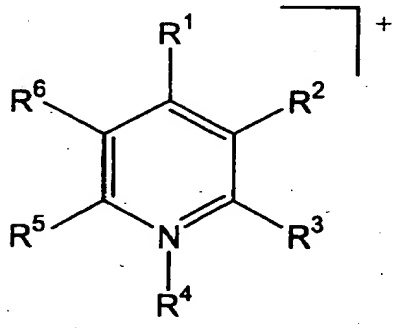
3. The tetrakisfluoroalkylborate salts according to claim 1, characterized in that the M^{n+} cation is a magnesium or aluminum cation.

4. The tetrakisfluoroalkylborate salts according to claim 1, characterized in that M^{n+} is an organic cation, preferably a nitrosyl cation, a nitryl cation, or an organic cation of general formula $[N(R^7)_4]^+$, $[P(N(R^7)_2)_kR_{4-k}]^+$, with $0 \leq k \leq 4$, or $[C(N(R^7)_2)_3]^+$, wherein each of the residues R^7 are the same or different, representing
H,
$C_oF_{2o+1-p-q}H_pA_q$, or
A,
wherein
$1 \leq o \leq 10$,
$0 \leq p \leq 2o + 1$,
$0 \leq q \leq 2o + 1$, and
A represents an aromatic residue optionally having heteroatoms, or a preferably 5- or 6-membered cycloalkyl residue.

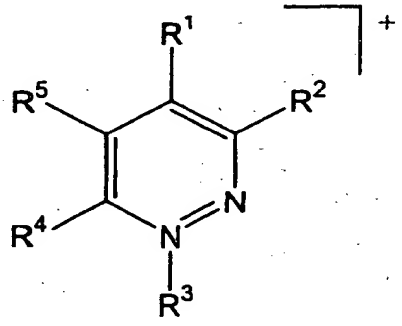
5. The tetrakisfluoroalkylborate salts according to claim 4, characterized in that $1 \leq o \leq 6$, $0 \leq p \leq 2o + 1$, and $0 \leq q \leq 2o + 1$, and A represents an aromatic residue optionally having heteroatoms, or a preferably 5- or 6-membered cycloalkyl residue.

6. The tetrakisfluoroalkylborate salts according to claim 4 or 5, characterized in that A represents a 5- or 6-membered aromatic residue optionally including nitrogen and/or sulfur and/or oxygen atoms, or a preferably 5- or 6-membered cycloalkyl residue, preferably a phenyl or pyridine residue.

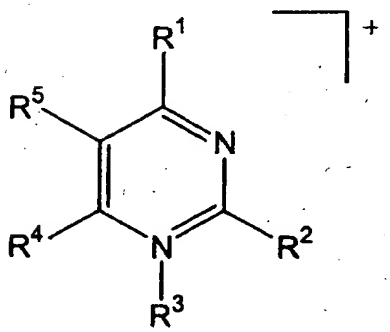
7. The tetrakisfluoroalkylborate salts according to claim 1, characterized in that M^{n+} is a heteroaromatic cation of general formulas (II) to (IX):



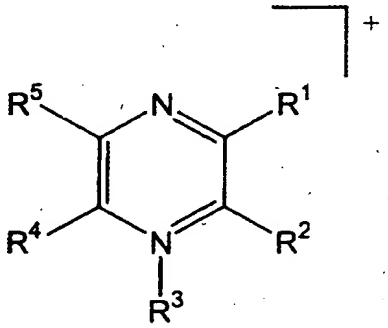
(II)



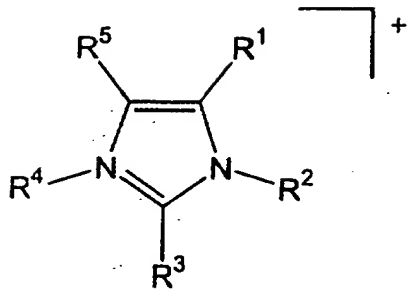
(III)



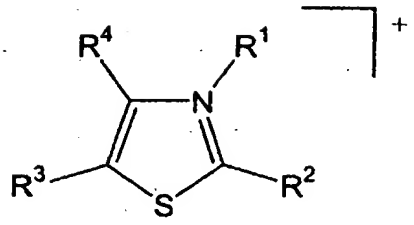
(IV)



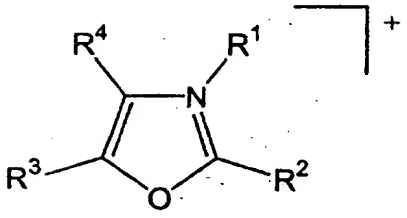
(V)



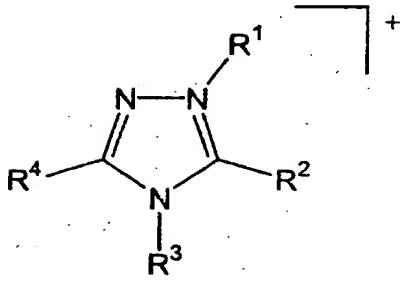
(VI)



(VII)



(VIII)



(IX)

wherein
the residues R^1 to R^6, each of which same or different, and optionally two of the residues R^1 to R^6 together, represent H, a halogen, preferably fluorine, or a C_{1-8} alkyl residue optionally substituted by F, Cl, $N(C_aF_{(2a+1-b)}H_b)_2$, $O(C_aF_{(2a+1-b)}H_b)$, $SO_2(C_aF_{(2a+1-b)}H_b)$, or $C_aF_{(2a+1-b)}H_b$ wherein $1 \leq a \leq 6$, and $0 \leq b \leq 2a+1$.

8. The tetrakisfluoroalkylborate salts according to any of claims 1 to 7, characterized in that each of the ligands R are the same, representing (C_xF_{2x+1}), with x = 1 or 2.

9. The tetrakisfluoroalkylborate salts according to any of claims 1 to 8, characterized in that each of the ligands R are the same, representing a CF_3 residue.

10. A method of producing the tetrakisfluoroalkylborate salts of claim 9, characterized in that at least one compound of general formula (X)

$$M^{n+} ([B(CN)_4]^-)n \qquad (X)$$

wherein M^{n+} and n have the meanings as in claims 1 to 9,
is fluorinated by reacting with at least one fluorinating agent in at least one solvent, and the thus-obtained fluorinated compound according to claim 1 having the general formula (I) is purified and isolated according to usual methods.

11. The method according to claim 10, characterized in that the reaction with the fluorinating agent is performed at a temperature ranging from -80 to +20°C, preferably from -60 to 0°C.

12. The method according to claim 10 or 12, characterized in that fluorine, chlorine fluoride, chlorine trifluoride, chlorine pentafluoride, bromine trifluoride, bromine pentafluoride, or a mixture of at least two of these fluorinating agents, preferably chlorine fluoride or chlorine trifluoride or a mixture of at least two fluorinating agents containing chlorine fluoride and/or chlorine trifluoride is used as fluorinating agent.

13. The method according to any of claims 10 to 12, characterized in that hydrogen fluoride, iodine pentafluoride, dichloromethane, chloroform, or a mixture of at least two of these solvents, preferably hydrogen fluoride, is used as solvent.

14. A mixture, including
a) at least one tetrakisfluoroalkylborate salt of general formula (I) according to claims 1 to 9, and
b) at least one polymer.

15. The mixture according to claim 14, characterized in that the mixture includes from 5 to 99 wt.-% of component a) and from 95 to 1 wt.-% of component b), preferably from 60 to 99 wt.-% of component a) and from 40

to 1 wt.-% of component b), each time relative to the sum of components a) and b).

16. The mixture according to claim 14 or 15, characterized in that component b) is a homopolymer or copolymer of unsaturated nitriles, preferably acrylonitrile, vinylidenes, preferably vinylidene difluoride, acrylates, preferably methyl acrylate, methacrylates, preferably methyl methacrylate, cyclic ethers, preferably tetrahydrofuran, alkylene oxides, preferably ethylene oxide, siloxane, phosphazene, alkoxysilanes, or an organically modified ceramic, or a mixture of at least two of the above-mentioned homopolymers and/or copolymers and optionally at least one organically modified ceramic.

17. The mixture according to claim 16, characterized in that component b) is a homopolymer or copolymer of vinylidene difluoride, acrylonitrile, methyl (meth)acrylate, tetrahydrofuran, and preferably a homopolymer or copolymer of vinylidene difluoride.

18. The mixture according to any of claims 14 to 17, characterized in that the polymer is at least partially crosslinked.

19. The mixture according to any of claims 14 to 18, characterized in that the mixture additionally includes at least one solvent.

20. The mixture according to claim 19, characterized in that organic carbonates, preferably ethylene carbonate, propylene carbonate, butylene carbonate, dimethyl carbonate, diethyl carbonate, ethyl methyl carbonate, or methyl propyl carbonate, organic esters, preferably methyl formate, ethyl formate, methyl acetate, ethyl acetate, methyl propionate, ethyl propionate, methyl butyrate, ethyl butyrate, γ-butyrolactone, organic ethers, preferably diethyl ether, dimethoxyethane, diethoxyethane, organic amides, preferably dimethylformamide or dimethylacetamide, sulfur-containing solvents, preferably dimethylsulfoxide, dimethyl sulfite, diethyl sulfite, or propanesultone, aprotic solvents, preferably acetonitrile, acrylonitrile, or acetone, or at least partially fluorinated derivatives of the above-mentioned

solvents, or mixtures of at least two of these solvents and/or fluorinated derivatives of these solvents are present as solvents.

21. A method of producing a mixture according to any of claims 14 to 20, characterized in that at least one tetrakisfluoroalkylborate salt of general formula (I) according to any of claims 1 to 9 and at least one polymer and optionally at least one solvent are mixed.

22. The method according to claim 21, characterized in that said mixing is effected at elevated temperature, preferably from 20 to 90°C, and more preferably from 40 to 60°C.

23. Use of at least one tetrakisfluoroalkylborate of general formula (I) according to any of claims 1 to 9 or at least one mixture according to any of claims 14 to 20 in electrolytes, primary batteries, secondary batteries, capacitors, supercapacitors, or galvanic cells, optionally in combination with other conducting salts and/or additives.

24. Electrolytes, including at least one tetrakisfluoroalkylborate of general formula (I) according to any of claims 1 to 9 or at least one mixture according to any of claims 14 to 20.

25. The electrolytes according to claim 24, characterized in that the concentration of the tetrakisfluoroalkylborate salts(s) in the electrolyte is from 0.01 to 3 mol/l, preferably from 0.01 to 2 mol/l, and more preferably from 0.1 to 1.5 mol/l.

26. Primary batteries, including at least one tetrakisfluoroalkylborate of general formula (I) according to any of claims 1 to 9 or at least one mixture according to any of claims 14 to 20.

27. Secondary batteries, including at least one tetrakisfluoroalkylborate of general formula (I) according to any of claims 1 to 9 or at least one mixture according to any of claims 14 to 20.

28. Capacitors, including at least one tetrakisfluoroalkylborate of general formula (I) according to any of claims 1 to 9 or at least one mixture according to any of claims 14 to 20.

29. Supercapacitors, including at least one tetrakisfluoroalkylborate of general formula (I) according to any of claims 1 to 9 or at least one mixture according to any of claims 14 to 20.

30. Galvanic cells, including at least one tetrakisfluoroalkylborate of general formula (I) according to any of claims 1 to 9 or at least one mixture according to any of claims 14 to 20.